

Vantage **Plastics**: Thermoforming

At Vantage **Plastics**, we offering thermoforming services to a wide variety of industries, including Automotive Manufacturers, Food Processing/Handling, Agricultural Manufacturers/Producers, Recreational Manufacturers/Products, Heavy Truck/Tractor Manufacturers, Medical/Bio Manufacturers/Distributors, Sustainable Energy Manufacturers and more.

Thermoforming is the process of taking a flat sheet of plastic and forming it into a contoured part or shape. This is done by taking a flat sheet of plastic and clamping it into a carriage, heating the sheet in a large oven, stretching the hot sheet over a mold and pulling a vacuum on the cavity to force the sheet to the contour of the mold. At this point in the process the sheet begins to cool with the assistance of fans placed around the mold and the plastic sheet becomes rigid again as it takes the shape of the mold.

There are several variations to thermoforming, including drape forming, pressure forming, and twin sheet forming. Each variation has advantages and disadvantages but the general process is the same.

Additionally there is a wide range of material choices available for thermoforming. These materials include High Density Polyethylene (HDPE), Polypropylene (PP), Acrylonitrile-butadiene-styrene (ABS), Polycarbonate (PC), and Thermoplastic Olefins (TPO). The most common material used for general purpose thermoforming is HDPE.

Advantage of Thermoforming

The Thermoforming process has many advantages over other types of molding. Most commonly it is compared to the injection molding process as either process can be used for a large number of

applications. Although they are often compared there are several drastic differences between the two processes.

Injection molding has its limitations when it comes to size of product and cost of tooling. A typical injection mold tool will cost roughly 33% more than a similar thermoformed tool, and the margin increases as the parts gets larger. Injection molding does not have a good prototype process, typically SLA or SLS parts are used for prototyping, which offer limited comparisons to the actual final product, can be expensive, and are not of the same material the final product will be made from. Thermoforming on the other hand utilizes a prototype tool made from wood or epoxy that can be used to create several finished parts of the product and formed from the same material as what the final product will be made from. Therefore many possible design or fit issues can be caught up front before going to production tooling, thus saving time and money.

When it comes to large parts, thermoforming wins hands down. From cost for both tooling and parts there is little comparison. A typical 45"x48" part for instance would have tooling at roughly half the cost of a comparable injection mold and the piece price is generally less as well, depending on material choice.

With any process there are limitations to what can be produced. If you have questions about the viability of using thermoforming for your application please contact our engineering staff at 989-846-1029.

Twin Sheet Thermoforming

Twin sheet thermoforming is the process of brining two sheets of thermoformed sheets together to make one part. This is accomplished by heating two sheets of plastic and pressing them together with two separate molds using platens, thus creating a mechanical bond between the two sheets. here are two methods of accomplishing this, one involves a single station set-up and the second involves using a four station rotary machine. For our discussions here we will cover the second method only.

The process is very similar to thermoforming a single sheet with an added step. The initial sheet is placed into the clamp frames and rotated into a large oven, the sheet is pre-heated in the first oven and then rotated around the second oven to finish bringing it up to the forming temperature, while this is happening the second sheet has entered the first oven and is being heated to almost the forming temperature, at a given point the carousel rotates and the first sheet is brought to one of the molds and is formed onto this tool. Meanwhile the second sheet has entered the second oven and is finished being brought up to forming temperature. At this time the clamp frame releases from the first sheet leaving the sheet on the mold, the carousel rotates and the second sheet is brought around to the second mold on the top platen, the top platen is lowered, takes vacuum, the sheet forms around the mold and then the platens are brought together and locked to create a bond between both sheets.

This process can be used to fulfill a large number of applications, from pallets to trays to consumer goods products. It is a rather unique process and requires special machines to perform the task, but the outcome can create very unique parts.

FEA (Finite Element Analysis)

Vantage **Plastics** has the capability to analyze the integrity of our designs before starting any tooling. We utilize SolidWorks Simulation to examine stress and displacement and determine if a design will meet our customers' expectations. This gives us the ability to determine structural problem areas, before physical testing is done.